

14. The method according to Claim 13 further comprising the step of pressurizing the formative fluid in the liquid state to a second selected pressure and wherein said material formation region is at a third selected pressure which is below the second selected pressure.

15. The method according to Claim 13 wherein said formative fluid comprises a solution of at least one formative compound in a carrier liquid, the formative compound being capable of forming said selected material in the formation region.

16. The method according to Claim 15 wherein said formative compound is capable of reacting in the formation region to form the selected material.

17. The method according to Claim 16 wherein said atomized spray is supplied with sufficient energy in the formation region to promote reaction of the formative compound to form the selected material.

18. The method according to Claim 13 wherein said formative fluid forms a powder in the formation region.

19. The method according to Claim 13 wherein a substrate is positioned within the formation region such that the selected material forms as a coating on the substrate.

20. The method of claim 19, wherein the material that coats the substrate comprises a metal, an oxide, a carbonate, a sulfate, a phosphate, a nitride, a carbide, a boride, or a combination thereof.

21. The method of claim 19, further comprising, cooling the substrate using a substrate cooling means.

22. The method of claim 19, wherein the material that coats the substrate comprises a carbonaceous material, a metal, an oxide, or a combination thereof.

23. The method of claim 19, wherein the material that coats the substrate comprises a carbonaceous material, an organic material, a polymeric material, or a combination thereof.

24. The method of claim 19, wherein the material that coats the substrate comprises a graded composition after the coating process.

25. The method of claim 13, wherein the material that is formed comprises an amorphous composition after the forming process.

26. The method according to Claim 13 further comprising a gas supply means and wherein the gas supply means admixes at least one gas reactive with at least one component of the formative fluid to form the selected material.

27. The method according to Claim 17 wherein the energy is a flame source which causes combustion of at least one component of said formative fluid.

28. The method of claim 27, wherein the atomized spray has a spray velocity and wherein the spray velocity is greater than the flame speed of the flame source, and the method further comprises the step of providing one or more ignition assistance means for igniting the spray.

29. The method of claim 13, wherein the energy source comprises a thermal, photon or plasma source.

30. The method of claim 27, wherein the pressure of the formation region is low enough such that the flame source has a temperature of less than 1000 °C.

31. The method according to Claim 13 wherein the pressure of the formation region is at ambient pressure.

32. The method according to Claim 13 wherein the pressure of the formation region is above ambient pressure.

33. The method according to Claim 13 wherein the pressure of the formation region is below ambient pressure.

34. The method of claim 13, wherein the pressure of the formation region is above 20 torr.

35. The method of claim 13, wherein the formative fluid is in part liquefied or dissolved gasses.

36. The method of claim 13, wherein the formative fluid further comprises butanol, methanol, isopropanol, toluene, or a combination thereof.

37. The method of claim 13, wherein the providing step further comprises, providing a reagent solution in a pressurized container, and contacting a standard temperature and pressure gas with the reagent solution at a selected pressure, to form the formative fluid.

38. The method of claim 37, wherein the reagent solution contains a reagent and the concentration of the reagent in the formative fluid is between 0.0005 M and 0.01 M.

39. The method of claim 37, wherein the reagent solution contains a reagent and the concentration of the reagent in the formative fluid is between 0.01 M and 1 M.

40. The method of claim 13, wherein the output end of the conduit further comprises a fluid introduction port and the method further comprises, prior to directing the formative fluid through the outlet port of the conduit, adding additional fluid to the formative fluid through the fluid introduction port to thereby form a combined solution having a reduced critical temperature.

41. The method of claim 13, wherein the formative fluid comprises one or more reagents and a carrier, and each of the one or more reagents has a vapor pressure of no less than about 25% of the vapor pressure of the carrier.

42. The method of claim 13, further comprising flowing a selected sheath gas around the atomized spray thereby decreasing entrained impurities and maintaining a favorable deposition environment.

43. The method of claim 13, wherein the output end of the fluid conduit further comprises a temperature regulating means positioned thereon and the step of regulating the temperature comprises regulating the temperature of the formative fluid at the output end.

44. The method of claim 13, wherein the step of regulating the temperature comprises providing means for resistively heating the fluid conduit by applying thereto an electric current of a selected voltage from an electric current source.

45. The method of claim 13, wherein the selected material is a powder, and the formative fluid comprises a reagent, and said reagent precipitates to form said powder.

46. The method of claim 13, wherein the selected material is a powder, and the formative fluid comprises a reagent, and said reagent chemically reacts to form said powder.

47. The method of claim 13, wherein the majority of the droplets that make up the atomized spray have a droplet size of less than 2 microns.

48. A powder, said powder comprising crystalline YSZ with a majority of the grains having a size of between 2-10nm.

49. The powder of claim 49 wherein the majority of the grains have a size of between 4-6nm.